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PROTECTION OF LAND RESOURCES: DEFORESTATION

Conservation and Development of Forests

Progress Report by the Secretary-General of the Conference

Background and Summary

The Preparatory Committee of the United Nations Conference on Environment and Development (UNCED) at its first session recommended in its Decision 1/14 that discussions on the issue of protection and sustainable management of forest ecosystems must be co-ordinated and compatible with other actions related to reduction of emissions of greenhouse gases, protection of biological diversity, rational utilization of biological resources and improvement of market conditions for timber and timber products that might be taken by the FAO, ITTO, UNEP and WMO in connection with conventions on climate change and on biological diversity and other relevant agreements.

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Furthermore, the Preparatory Committee requested the Secretary-General of the United Nations Conference on Environment and Development (UNCED) to prepare for the second session of the Preparatory Committee, with the assistance of the relevant international organizations and in close consultation with Governments, recognizing their sovereignty over their natural resources within their territories, a comprehensive report, to cover various aspects of forest and forestry related technical, economic and social matters, and to suggest to the Preparatory Committee, at its second session, options for the co-ordination of national, regional and international action on forests.

As a follow-up to this decision the Secretary-General of UNCED convened an Ad-Hoc Working Party on Forests which provided advice and support for the preparation of this report. Due to constraints in its preparation this report still has to be supplemented in some of the areas. This supplementary information will be presented at the third session of the Preparatory Committee.

Substantive contributions for the preparation of the report were received from several United Nations organizations, (FAO, UNCTAD, UNDP, UNESCO, UNRISD and the World Bank). The Secretariat also received valuable support from several intergovernmental organizations and from non-Governmental organizations and experts and, in particular, from the International Tropical Timber Organization (ITTO), Greenpeace International the World Resources Institute (WRI).

Introduction

The concept of forests has evolved at a different pace and time in different parts of the world. In general it has developed from an approach that considered forests as wastelands or just hunting grounds to a more comprehensive view which includes its plants and animal components together with the role it plays for the benefit of society as a producer of goods and services. The concept of forest bears different meanings for different people depending on how close to the forest they live, the sort of benefits that they derive from it or the plans they have in respect of the resources which the forest contain.

During the last two decades major attention has focused on to the status of the tropical forest. However, governments, scientists and the international community started raising their voices in concern for the status of all forests and not only those of the tropical countries during the early 1980s.

This concern was precipitated, in part, when information confirmed the high level of tropical forest loss; and, in part, when the developed countries realized that the deteriorating situation extended to their own forests as a result of air pollution.

The world forests are subject to a number of natural and anthropogenic pressures. Climate changes, air pollution, soil acidification, recreational needs, needs for more farmlands to produce food, fodder or raw materials, such as timber, fuelwood or other forest goods are only some of these pressures. These pressures have resulted in substantial forest loss.

In the mid-1980s deforestation and forest degradation throughout the world gave rise to important initiatives at the international and regional levels, such as the launching of the Tropical Forestry Action Plan by FAO, UNDP, the World Bank and the World Resources Institute (1985); and, the International Conference on Forests and Trees ("Silva") organized by the French Government (February 1986).

At the national and local levels some countries have been induced to take more drastic and sometimes direct measures. Thus, Bolivia has launched a five-year ecologi al "moratorium" which includes, *inter alia*, temporarily suspending logging concessions; Brazil has, among other measures, modified its incentive policies for cattle ranching which is one of the main causes of clearing in the Amazonian forest; Guyana has set aside an area of 360,000 ha of tropical forest for conservation and research; and, Vietnam has launched a Forestry Development Strategy from 1991 to 2000 and India has launched a conservation oriented forestry policy. New Zealand has established a ban on the export of indigenous forests products unless harvested from a forest with a certified sustained management plan.

The present report deals with the status of the world's forests, their role in the conservation of habitats of biodiversity; as sinks of greenhouse gases and as source of energy for rural communities. It also analyzes briefly the problems related to the assessment of the economic value of forests, and the effects of trade barriers. After looking into the role played and recent reports issued by concerned organizations, it suggests some options for activities oriented towards conservation and development of forests.

SECTION I

Status of the World's Forests

1. Status of world's forests

For the purpose of this section by the word "forest" is meant any vegetation type whose trees cover with their crown at least 10 to 20 per cent of the ground; while the word "tree" is meant "woody perennial plants typically large of more than 7 metres high* at mature stage and with a single well-defined stem carrying a more or less definite crown".

The diversity of forest types can vary enormously. The first reason for this is the wide range of ecological conditions under which they grow. A very large number of forest vegetation classifications exists at global, regional, sub-regional and national levels which use various criteria (ecological, physiognomic, physiographic and other). The UNESCO "International Classification and Mapping of Vegetation" and the Josef Schmithusen "Atlas für Biogeographie" are two important authorities at world level. The latter, for instance, distinguishes some thirty types of tropical and sub-tropical forests and woodlands, and approximately the same number in the temperate, subtemperate and Mediterranean zones, and six types of boreal forests. To these must be added the large number of other woody vegetation types, especially the shrub formations and scrubs.

Diversity of forest types also results from the past and recent history of interference by man (forest clearings, logging, grazing, fires) and by other man-induced and natural factors (air, soil and water pollution, pests, diseases, hurricanes).

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* *This minimum tree height (and maximum shrub height) must be interpreted with flexibility and may vary between 5 and 8 metres approximately.*

2. Extent and distribution of forests and other wooded lands

Table 1 pictures the situation in terms of areas of forests as at end 1980, date of the last comprehensive survey of world forest resources carried out by FAO (in co-operation with UNEP for the tropical countries, and with the UN Economic Commission for Europe for the developed countries). It shows that ten years ago forests covered an estimated 3.6 billion ha (36 million Km^2) 27.6 per cent of the total land area (excluding Greenland and the Antarctic) of our planet. Forests of the tropical countries and territories covered some 1.95 billion ha (54 per cent of the world total forest area), representing 40 per cent of their land area.

The preliminary results of the new tropical forest resources assessment being carried out by FAO indicate that the total forest area of the tropical countries and territories may have been reduced by 1990, i.e. ten years later, by a further 200 million ha since its estimate made earlier with 1980 as the full reference year. Though full information is not yet available, there are indications that the overall change in forest area for the rest of the world during the last ten years is small in comparison with that occurring in the tropics. Forest areas in the boreal and temperate parts of the world in 1990 are, therefore, close to those of Table 1, while the total forest area of the tropical countries/territories and that of the whole world have to be reduced by 200 million ha.

Other wooded lands also occupy large areas. They can be grouped into three main categories, i.e. vegetation types whose trees cover less than 10 to 20 per cent of the ground with their crown; scrubs, thickets and shrub vegetation types; and forest fallow, mostly in the tropical zones, made up of all complexes of woody vegetation derived from the clearing of natural forests in shifting cultivation systems. In 1980 these other wooded lands were estimated to cover some 1.7 billion ha (17 million Km^2) or 13 per cent of the total land area (excluding Greenland and Antarctica) of the world (1.05 billion ha in the tropical world and 0.65 billion ha outside the tropics).

3. "Natural" forests

Forest area figures given in Table 1 include the "natural" forests and man-made forests (forest plantations). The expression "natural forests" must be better understood. Only a small proportion of these forests are, "climax", i.e. resulting exclusively from the past and present influences of ecological factors. In the humid tropics, a significant part of the so-called "primary" forests have been altered by man in historical times. In particular, they may have been cleared for cropping and grazing long ago and then left to reconstitute themselves (as has been the case in some historical sites like the Maya settlements in Mexico and Guatemala or the Angkor-Vat region in Cambodia) and are, thus, old secondary forests.

It is easier, under the current assessment methodologies to identify and estimate the areas of undisturbed forests, i.e. those forests which have not been either cleared or

TABLE 1 - AREAS OF FORESTS AT END 1980

BY CONTINENTS AND MAIN ECOLOGICAL ZONES

(in million hectares and in percent of land areas)

SOURCE: FAO 1991

ECOLOGICAL ZONES	CONTINENTS (with related islands)	Africa	America	Asia (without Asian part of USSR)	Pacific	Europe (including whole of USSR)	TOTAL
BOREAL COUNTRIES [a]	Number of countries/territories [a]	0	2	0	0	4	6
	Total (boreal) land area	0	910	0	0	1280	2190
	Total population (in millions)	0	4	0	0	39	43
	(Boreal) [in millions ha]	0	203	0	0	717	920
	forest area [in percent of (boreal) land area]	0	22.3%	0	0	56.0%	47.0%
TEMPERATE COUNTRIES/ TERRITORIES (including MEDITERRANEAN and SUB-TEMPERATE	Number of countries/territories [b]	10	10 [b]	20	8	32 [b]	80 [b]
	Total (non-boreal) land area	727.3	1331.1	1755.9	788.7	1420	6023
	Total population (in millions)	119.6	290.4	1316.2	17.9	710.8	2454.9
	(Non-boreal) [in million ha]	8.1	342	188.4	48.7	159.5	746.7
	Forest area [in percent of (non-boreal) land area]	1.1%	25.7%	10.6%	6.2%	11.2%	12.4%
TROPICAL COUNTRIES/ TERRITORIES [c]	Number of countries/territories	46	3922	16	0	123	
	Total land area	2237.3	1651.6	921.4	54.2	0	4864.5
	Total population (in millions)	359.9	318.9	1267.1	5	0	1950.9
	Forest area [in million ha]	701.2	889.8	303.4	42.6	0	1937
	Forest area [in percent of land area]	31.3%	53.9%	33.7%	78.6%	0	40.0%
ALL COUNTRIES/ TERRITORIES	Number of countries/territories	56	49	42	24	32	203
	Total land area	2964.6	3892.7	2677.3	842.9	2700	13077.5
	Total population in millions	479.5	613.3	2583.3	22.9	749.8	4448.8
	Forest area [in million ha]	709.3	1435.8	491.8	91.3	876.5	3604.7
	Forest area [in percent of land area]	23.9%	36.9%	18.4%	10.8%	32.5%	27.6%

[a] Six countries are classified as "boreal" because they have forests in the boreal zone (Canada, Finland, Norway, Sweden, USA and USSR). Greenland and Antartic territories, which have no forests, are not included.

[b] Including the six countries classified as boreal, which all have temperate forests.

[c] A country or territory classified as "tropical" if the majority of its land area is situated between the the two tropics or subject to tropical climatic influences (e.g. Mexico and Nepal are tropical, but Argentina, Australia and China are not).

logged in the recent past (say 60 to 80 years). In 1980 undisturbed but potentially exploitable closed forests in the tropics (rainforests and other types) amounted to some 670 million ha. In the late 1970s 2.0 million ha. were being cleared and 4.4 million ha. logged annually. Taking into account the increase in rates of clearing during the 1980s, their area may have been reduced to some 590-600 million ha in 1990. To this area must be added that of most closed forests left unused because of their inaccessibility or for legal reasons (protected areas). Their area amounted in 1980 to some 310 million ha and can be roughly estimated at 290 million ha in 1990. Only a very small part of the woodlands of the dry tropics is undisturbed, since practically all these stands are affected by naturally or intentionally caused fires, by grazing and by extraction of fuelwood and other forest products. In the temperate and boreal zones of Europe and North America some 420 million hectares were not disturbed in the early 1980s, either because they were not exploitable or were located within protected areas. To give a comprehensive picture, to this figure must be added the areas of undisturbed forest of other temperate zones of the world (Argentina, Australia, Chile, China, New Zealand, Japan, Korea, Mongolia, Nepal, Near East, South Africa) where the total forest areas amounts to some 300 million ha.

4. Management of forests for production

Though regulations of the temperate forests appeared to have existed in Europe in ancient times, it is only since the 16th century, and particularly since the 19th century, that harvesting regulations as well as silvicultural treatments were first introduced. This was in the form of management (or "working") plans for the forests whose main management objective was the production of wood and, possibly other products (goods and services).

In the boreal zone, the Scandinavian countries have carried out sustainable utilization of productive forests through fairly intensive management for several decades. Sustainable forest management has been achieved to a lesser degree in Canada and in the boreal forests of USSR. In the developed countries the general rule is that management is practised on a sustainable basis in the publicly-owned forests (State and communes mostly) and in those owned by industries whilst minimum care is given to forests owned by private individuals. Some temperate developing countries have introduced management, particularly in plantations of exotic species and very occasionally in indigenous forests. In the tropical zone an estimate of only 4.7 per cent of the productive closed forests were considered to be managed in 1980 (42 out of the 885 million ha). Of this area, 37 million were found in South Asia alone, mostly in deciduous forests (e.g. teak and sal forests). In tropical Africa and America forest management of native forests exists mainly in the form of experimental and pilot projects.

5. Management of forests for conservation

In the tropical zone the total area of closed and open forests within national parks and other protected areas for conservation was estimated at 87 million ha or 4.4 per cent of the total forest areas. The level of implementation of management plans varied from non-existent to satisfactory, depending on the countries and protected areas within those countries. In comparison, at the beginning of the 1980s some 58 million ha of forests were included within "national parks and nature reserves" in Europe, USSR and North America.

6. Deforestation and degradation of forests

It is essential to distinguish between deforestation in the strict sense of the term, which occurs when a forest is cleared to give way to another use of the land (e.g. agriculture, roads, dams, human settlements) and forest degradation when the species diversity and the biomass are significantly reduced through, for instance, unsustainable forms of forest utilization, such as over exploitation for wood and overgrazing. Deforestation may be the ultimate stage of forest degradation. This happens when the forest biomass is so much reduced that the crown cover of the trees is less than the minimum required to define the stand as a forest, unless this reduction is only temporary (temporarily "unstocked" forest which is regenerated artificially or left to regenerate naturally). This type of deforestation occurs, for instance, around large cities in the Sahelo-Sudanian zone where woodlands are being over-exploited for fuelwood.

6.1. Deforestation

Many developed countries have suffered from deforestation in the past. Some of them are only recently recovering from the effects of such deforestation while several are still suffering from the occurrence of forest fires causing serious damage as is the case in France, Greece, Spain, USA, USSR and others. Over 500,000 ha of forest and woodlands are affected by forest fire each year in the Mediterranean basin countries alone.

For the tropical zone, the FAO/UNEP Tropical Forest Resources Assessment Project estimated in 1980 that 11.4 million ha of closed and open forests were being cleared annually (3.7 million ha in tropical Africa, 5.7 million ha in tropical America and a 2.0 million ha in tropical Asia or 0.53 per cent, 0.64 per cent and 0.64 respectively). The causes of deforestation in the late 1970s varied according to regions, with the expansion of the agriculture frontier being the most important overall single factor, accounting for 45 per cent of total overall deforestation. The highest percentage up to 70 per cent was in tropical Africa. Other important causes were ranching (in tropical America), colonization programmes (mostly in tropical America and Asia), permanent cash crop agriculture, and over-exploitation for fuelwood in the dry zones of Africa.

The preliminary results of FAO's Tropical Forest Resources Assessment 1990 Project covering 52 countries representing 79 per cent of the world's tropical forest cover in 1980, showed that between the period 1981-1990 the annual deforestation rate was as high as 16.8 million ha. Though this latter estimate needs to be refined through additional interpretation of remote sensing imagery and ground control, there is evidence that deforestation has accelerated throughout the tropics, except in those countries (notably in tropical Asia) where relatively little forest cover is left.

In the temperate and boreal zones, deforestation rates have not been systematically assessed. The main reasons for this are that deforestation is relatively limited in contrast to what happens in the tropics, and is often compensated by afforestation and reforestation. In the southern Mediterranean countries and the rest of the Near East, forest degradation, mainly through overgrazing and overcutting, has lead to deforestation and complete denudation of large tracts of land. Information on deforestation in the temperate developing countries in Asia and America still needs to be further assessed.

6.2. Degradation of forests

In all parts of the world, whether boreal, temperate or tropical, forests are subject to various forms of degradation caused by a wide range of factors. Some of these factors are natural, such as pests and diseases (though some may be the effect of human intervention), storms and hurricanes and other climate hazards like droughts and frosts. However, the most important causes of forest degradation nowadays originate from anthropogenic action: unsustainable utilization of forest resources, such as indiscriminate logging and over-exploitation for fuelwood, overgrazing, forest fires, air pollution and wars.

It is extremely difficult and costly to quantitatively assess forest degradation since, in particular, contrary to most forms of deforestation, changes corresponding to degradation are often gradual and cannot be perceived and measured easily from one year to the other. Quantitative data are generally lacking except when the changes are relatively rapid and can be characterized by good indicators, and the monitoring capability exists, as in the case of degradation caused by air pollution in the developed countries.

In the developing countries, particularly in the tropical zone, logging is a cause of degradation of forest ecosystems when its intensity is high (such as in Dipterocarp forests of South-East Asia) and when it is not carried out within the framework of sustainable management. Over-exploitation for fuelwood and charcoal, together with overgrazing and repeated bush fires, remain a serious threat in most dry zones of the tropics, particularly in Africa and South America. Fires have also spread over wide areas of heavily disturbed forests in the humid tropics during the 1980s, facilitated by

particularly dry weather conditions (Kalimantan in 1982, Cote d'Ivoire in 1983; Brazil in 1987 and 1988).

In the Mediterranean zone, the most serious threats combine overgrazing and fires. In the southern European countries in the mid 1980s FAO reports some 30 to 40,000 fires which affected annually some 500,000 ha of forests and other wooded lands.

The fire risk situation is less serious in the boreal and temperate zones, except in some cases when a conjunction of unfavourable events (prolonged drought, strong winds and late control operations) may cause huge fires (northern China in 1988; Yellowstone Park, USA, in 1988; and, Central Canada in 1989). The main cause of forest degradation in the developed countries all of them located in the temperate zone, has been, for the last ten years at least, the result of local and transboundary air pollution. In 1988 the compilation of the forest damage survey (Forest Damage and Air Pollution: Report of the 1988 Forest Damage Survey in Europe ECE/UNEP, 1988) carried out in European countries and some USSR Republics revealed that between 0.6 per cent (Portugal) and 5.4 per cent (Czechoslovakia) of all trees were severely defoliated or dead, with an additional 0.7 per cent (Portugal) to 22 per cent (Czechoslovakia) with a moderate defoliation and that in more than 18 countries over 30 per cent of the forest areas were affected. Forest damage as a result of air pollution is also observed in industrialized and densely populated areas of North America and East Asia and, specially around large urban concentrations throughout the world.

Deforestation and forest degradation have many and important negative consequences for the food security and well-being of present and future generations. Their effect in especially sensitive areas such as mountain ecosystems is particularly serious with further consequences on water cycles, soil and snow stability and the loss of genetic diversity found in these areas. The Andes, the Himalayas and the Alps, among others, are examples of such impact. Two consequences of global concern which should be underscored are the loss of biological diversity, and the impact on the climate.

7. Afforestation and reforestation

Afforestation is plantation of forest trees on land which previously did not carry forest, while reforestation is plantation on land which carried forest within living memory and involves the replacement of the previous forest cover with a new, and often essentially different one.

FAO estimated the total area of man-made forests existing in 1980 in the tropical countries at 11.5 million ha, and that for the whole developing world (including the tropical and temperate countries) at some 29 million ha. The annual rate of successful planting for the period 1981-85 had been projected ten years ago at 1.1 million ha. Given the regular increase, during the 1980s, of the rate of plantation establishment, particularly at community and farm levels, the total area of man-made forests is likely to have reached 25 million ha in 1990 in the tropical countries alone.

It is important to note that the above refer to plantation of forest trees in stands or blocks. However, the plantation of individual trees in lines (e.g. windbreaks and shelterbelts, roadside planting) or separate and scattered (e.g. in homestead gardens), and the planting of perennial cash crops (such as rubber and oil palm) must also be taken into account and they have great significance in most countries. The latter type of plantation increase the estimates given in the previous paragraph.

It is difficult to have precise estimates of planted areas in the developed world due to the difficulty of separating areas regenerated artificially within the framework of forest management plans from those being planted and the general lack of regular systematic collection of data.

SECTION II

Assessment of the Role of Forests

Introduction

For many years, forests have been considered mainly as land covered by trees from which timber or firewood could be extracted, or which could be converted to what was considered to be more economically productive uses, such as agriculture and cattle ranching. During the last two decades a more comprehensive view has prevailed, which takes into account the full range of other goods and services produced by the forest: provision not only of timber and firewood, but also of medicinal and other plants of use to humankind, as well as provision of environmental services, such as the protective role of forests for the conservation of soil, water, genetic resources and biological diversity. The recent highlighting of the role of forests as carbon sinks to reduce the effects of CO_2 in the atmosphere, and thereby helping to contain warming of the atmosphere, has extended the services rendered by the forests to a global level.

1. AS HABITATS OF BIODIVERSITY

1.1 Assessment of the role of forests as habitats of biological diversity

Genetic losses and extinction of plant and animal species are today occurring at an increasing pace, due mainly to pressures on and consequent loss of natural ecosystems, particularly forests, and to selection and genetic improvement without due concern to genetic conservation.

Natural forests and woodlands contain not only woody species and wild animals but a wealth of other species of actual or potential socio-economic

importance at the global, national and local levels, including microorganisms and wild relatives of important crop species. Tropical forests are among the most complex ecosystems in the world in terms of species composition and interactions, structural variability and biological and ecological functions. Other forest ecosystems should not, however, be neglected as they contain species and genetic diversity specific to their location in latitude and altitude.

1.2. Strategies of conservation

The values derived from genetic resources are associated with the different levels of organization of diversity that exist in nature, from ecosystems to species, populations, individuals and genes. In considering the conservation of genetic resources, it is of utmost importance to clearly specify objectives aimed at as it is possible to conserve an ecosystem and still lose specific species; and to conserve a species and lose genetically distinct populations, or genes which may be of value in adaptation and future improvement of the species. Conversely, the loss of an individual species, of distinct populations or of individuals or genes, may pose a threat to the continued existence of the specific ecosystems of which they are part.

There are two basic strategies for genetic conservation, *in situ* (on-site) and *ex situ* (off-site, i.e. in genebanks, arboreta, botanic gardens, etc.). These two strategies are complementary and should be carried out in parallel in the case of conservation of species and intra-specific genetic variation; ecosystem conservation is, by definition, done on-site, however, as stressed above, it must be carried out in parallel with conservation *in* and *ex situ* of component species and their genetic variation.

Provided basic, genetic principles are applied and sustained, managed utilization of the forests can be compatible with *in situ* conservation of genetic resources. Harmonizing utilization and conservation is a key to genetic conservation, in the short as well as long term.

1.3 Methodologies of conservation

The general principles of conservation are the same for all living organisms. However, the strategies and methodology of conservation will vary according to the precise objectives of conservation, and the distribution and biological nature of the material to be conserved. Information on species distribution, variation, variation patterns and their biology and genetics, is needed to elaborate sound methodologies of conservation. However, the time available to save valuable ecosystems and species is too short to carry out accurate ecogeographic surveys and detailed species or ecosystem-specific research prior to initiating action. There is no real justification in delaying conservation activities in target species/ecosystems.

Many species cannot, at least with present knowledge, be conserved outside of their habitat and in the absence of the associated species found in the ecosystem in which they occur. The conservation of a range of representative ecosystems is therefore necessary. While attitudes and many of the needs of future generations cannot be reasonably predicted, we have a clear responsibility to keep options open and to prevent, to the best of our ability, the depletion or destruction of natural areas and the genetic diversity they contain.

Conservation of biological diversity should become part and parcel of plans for sustainable management of forests. Due consideration should be given to the ecological requirements of endemic and migratory species Although the protection of highly sensitive areas should be given a significant priority, the role of trees and shrublands outside protected areas should be one important component of biological diversity conservation. Finally, action should be oriented in a way which will ensure biological diversity conservation of most if not at the different types of forests and not only focused in few ranges , selected on the basis of their high endemism or number of species.

In this context, the PrepCom may wish to consider the potential areas for action in the report on Conservation and Biological Diversity (A/CONF/...).

2. ASSESSMENT OF THE ROLE OF FORESTS AS SINKS OF GREENHOUSE GASES

1. Contributions of Deforestation and Forest Fires to the Greenhouse Effect

Forests can contribute to slowing the rate of global climate change. However, it must be kept in mind that the major source of carbon dioxide, the principal greenhouse gas, is the burning of fossil fuels. Forests can provide some relief to what must be considered primarily an energy problem.

Forests and forestry are important elements in respect of climate change. Certain forest practices contribute to increased levels of greenhouse gases and global warming. Forests can reduce the effects of climate change by absorbing and storing atmospheric carbon. The forest ecosystem, productivity and health is affected by climate change.

The main source of the increase in atmospheric CO_2 comes from the burning of fossil fuels. Deforestation and burning of forests are additional sources. Wildfires, burning of open woodlands by man to regenerate fodder for domestic animals and slash burning also adds to the level of greenhouse gases.

2.2 Forests and Mitigation of Climate Change

Green plants remove CO_2 from the atmosphere through photosynthesis. Forests are effective carbon "sinks" because they store atmospheric carbon for long periods as woody tissue. Therefore, an increase in the world's forest area is a potential way to reduce the rate of increase of atmospheric CO_2. This expansion should be encouraged where it is ecologically viable, socially acceptable and economically feasible in the broadest sense. An approach which includes management and protection of existing forests, reforestation or afforestation of appropriate areas and utilization of wood products to avoid carbon release would maximize opportunities forests offer to reduce the effects of climate change.

If efforts to expand the area of forest cover are based on sound principles of ecology and silviculture, they will also provide a number of benefits to human society over and above the reduction of greenhouse gases.

2.3 Effects of Climate Change on Forests

Forest may be both positively and negatively affected by climate change. Higher mean temperatures, increased levels of atmospheric CO_2 and increased precipitation could result in increased growth rates and productivity of some species, but climate change will induce the shifting and in a first phase reduction of the natural ranges of trees and other living components of the forest ecosystems, loss of genetic variability, possible loss of species, massive decline of forests and increased incidence and severity of wildfire.

2.4 Conclusions

Climate change will continue to be one of the foremost environmental issues for the remainder of this decade and well into the next century.

If the world's forests are to be effectively utilized as carbon "sinks" and the impacts of climate change on forests are to be minimized, then work would have to be undertaken in a number of areas., This would include measures to arrest deforestation and increase the net area of the world's forests through a combination of actions. Carbon storage could become one management objective in the development of forest plans, in addition to the production of the wood and non-wood products, soil and water conservation, wildlife, recreation and the many other values forests provide. It would necessary to expand research to more clearly define the various interrelationships between forests and climate change, particularly with regard to the capacity of various forest ecosystems to sequester carbon; and design and implement monitoring systems to detect

changes in the extent and condition of the world's forests which may be the direct or indirect result of climate change.

SECTION III

Role of Forests as a Source of Energy for Rural Communities and Alternative Sources of Energy to Combat Deforestation

Fuelwood and charcoal supplied 17 per cent of the total energy consumption in developing countries in 1990, but their importance is even greater in rural areas where they constitute the main source of energy to most household and rural industry needs. Information regarding the overall volume of production and demand has proved good but still incomplete. It would appear that in the transfer of forested land to other uses opening woodlands for agriculture has a more significant effect than fuelwood demand, which is an aggravating factor in the process.

Over 2000 million people use wood for domestic heating and cooking and projections for the year 2000 suggest that, without remedial action to improve the situation, 2400 million people will by then either be unable to obtain their minimum energy requirements or will be forced to consume wood faster than its being grown. By the year 2000 the world fuelwood deficit could reach 960 million cubic metres a year, the energy equivalent of 240 million tonnes of oil a year. That is at current oil prices of US$ 30 a barrel, over US$ 45 billion a year.

The Nairobi Plan of Action adopted at the United Nations Conference on New and Renewable Sources of Energy (Nairobi, August 1981), recommended that the annual rate of tree planting in developing countries be increased by a factor of five by the end of the century. Unfortunately little action has been taken on the basis of this recommendation. Current estimates indicate that on average every person in the developing countries consumes about 0.45 m^3 of wood as fuelwood or charcoal a year.

In general, biomass based energy systems, if well managed, can form part of a matrix of energy supply which is environmentally benign and can contribute to sustainable development. Impacts derived from biomass based energy systems may be less damaging to the environment than those of conventional fossil fuels since they produce local and limited impacts on their surrounding environments, compared with the larger impacts distributed over greater areas by fossil fuels.

As compared to the number of people involved and their lack of access to alternative fuels, the fuelwood crisis and its concomitant problems in the developing countries have received insufficient attention and assistance from the international and bilateral community

There is the likelihood that the crisis will persist into the twenty-first century, unless there is a serious re-thinking of the crisis, its causes and problems, on the part not only of the assisting community, but also on the part of the developing countries themselves, by giving a significantly higher priority to this issue in their overall development plans, particularly in their energy and forestry policies and strategies.

When evaluating the effects of forest and trees biomass for energy purposes due attention should be given to the demand of the rural and urban poor, but also to the demand for charcoal from other levels of the society and from some specific industrial needs, such as manufacture of pig-iron, bakeries, etc.

This decade may be the most appropriate time for the relevant assistance agencies and concerned countries to increase efforts to achieve self-reliance and wherever possible self-sufficiency in fuelwood needs as well as to significantly augment their technical capabilities in this sector. For example, despite the effects of the fuelwood crisis as a factor in deforestation it is not seen as a matter of major concern in many countries where "'free' open-access wood resources, the bulk of which are Government owned still account for 80-90 per cent of the supply both for charcoaling and for direct firewood use" (World Bank 1987).

The strategies to ameliorate or solve the fuelwood crisis have generally consisted of, or included, the establishment of fuelwood plantations ranging from large scale urban plantation to small scale rural woodlots. The former have in many cases failed in alleviating the problems of the poorer sectors of the population due mainly to the high cost of its establishment ranging from over US$800 up to US$7000 per hectare; and their competition for land space with agriculture.

Failures in earlier small rural woodlots projects have often been due to the focusing in the production of fuelwood without due consideration of other products--which fetched better market prices--produced by the plots.

Experience has shown that fuelwood shortages are real, but that they need to be addressed by focusing on the role that trees play in the socio-economic and cultural life of rural people. Community forestry approaches should help develop locally appropriate solutions for ensuring that fuelwood supplies are adequate and truly obtainable. Such efforts should give due attention to the demand side and the markets and pricing structures. This should be complemented with action oriented towards wood-use efficiency, such as the promotion of improved stoves and improvement in charcoal production systems.

Alternative energy sources such as solar energy, wind energy and biogas have not had so far the impact in rural areas in developing countries, so as to result in any notable decrease of fuelwood consumption. These alternatives which are technology intensive have little opportunity to penetrate low income rural areas without intensive governmental intervention including the supply of equipment (and spare parts), subsidies and training.

SECTION IV

Economic Value of Forests

1. **The economic value of forests**

Forests means something different to different people. This perception may vary in space and time and so can its value. In general terms, however, most of the methodologies used up to now to assess the economic value of forests have been based on its capacity to produce timber of a certain quality on the value of this timber in the local or remote markets. Even the replacement value of fuelwood collected for local consumption or marketing is often not included in the value calculations. Very little, if any, of the other functions of the forests have been considered in this quantification. More recently, some efforts have been made to find ways through which a more comprehensive view could be given to the value of forests. But universally accepted methodologies are not yet available.

One major problem in calculating a comprehensive value of forests is that the costs and benefits linked to this resource are not necessarily charged to or received by the same people. For example, firewood, wildlife and medicinal plants may benefit the local dwellers while hardwood logs will have more attractive markets far away from the forest. At the same time the greenhouse gas storage capacity of a forest will play an important role perceived mainly at a global level while it has little importance if any to the local farmer. Its role as a regulator of the water cycle will be of higher interest to the farmer in the lowlands than to the one in the highlands.

The value of forests and its products also varies according to the cultural and market values and strongly depends on the relative location of the latter.

Several recent initiatives have been looking into the subject of forest values including work by the IIED, the Harvard Institute for International Development, WRI, WWF and others.A joint project is now being developed by FAO, UNEP, the World Bank and the University of Minnesota which is geared towards the development of methodologies to assess the value of forests under different condition and with a more comprehensive approach. Its results are expected to be available by early 1992.

The basic reason to value the contributions of forests to human welfare is to provide a better basis on which to make decisions about the use and protection of forests. Economic values traditionally are used to compare different uses of resources on a common basis; and many decisions are based on judgements concerning trade offs in benefits and costs (values). Thus, having a better idea of values of the multiple outputs (goods and services) from forests will help make better decisions on its future.

It should be pointed out, however, that most decisions concerning the use of forests, and particularly the tropical forests, are not made on the basis of a comparison of costs and benefits using traditional western economic approaches. Rather, a great number of political, social cultural and religious factors enter the picture. This is not unique to developing countries.

Despite this fact, economics probably enters the decision-making process more than we commonly think. The problem often is one of "values from whose point of view?" For example, from the point of view of slash and burn farmer, it may be very rational from an economic point of view to move on to the next hectare of forest: he has no choice if he and his family are to survive. Thus, the value he attaches to cleared land far exceeds any value he might attach to the standing forest, which, in any case, will still surround his plot. From the point of view of someone living comfortably in a city, the opposite may be the case. What matters, of course, is the values used by the decision maker--the person who actually determines what happens to the forest.

A central point about any economic values attached to the multiple outputs of forests is their relative nature. There is no absolute economic value associated with the multiple uses of forests. Values attached to such uses depend on demand and supply at any given time and place and on the availability of substitutes. Values also depend on power, or on who controls resources in the broadest sense.

2. Approaches to valuing the multiple contributions of forests to human welfare

There are many different types of economic values associated with natural forests. A convenient classification is as follows:

CLASSIFICATION OF MULTIPLE USE VALUES OF FORESTS

I. USE VALUE OF FORESTS	
DIRECT VALUES	INDIRECT VALUES
1. Consumptive: 1.1. Indigenous consumption; 1.2. Commercial/industrial C. 2. Non-consumptive: 2.1. Visual resources; 2.2. Recreation; 2.3. Research/education.	1. Ecological services. 2. Watershed protection. 3. Protection of species & genetic diversity. 4. Soil formation and fertility. 5. Socio-cultural values. 6. Living environment for indigenous people.

II. NON-USE VALUE OF FORESTS	
DIRECT NON-USE VALUES	INDIRECT NON-USE VALUES
1. Existence values. 2. Option values. 3. Future generations. 4. Others' use of resources. 5. Others' level of well-being.	1. Value of keeping the ecosystem functioning.

III. RECOMMENDATIONS FOR THE FUTURE
1. QUANTIFY THE MULTIPLE OUTPUTS; 2. ASSESS DISTRIBUTION OF COSTS & BENEFITS FROM FOREST USE; 3. ANALYZE VALUE PARADIGMS USED BY DECISION MAKERS; 4. DEVELOP AND IMPLEMENT RATIONALE FOR DECISION-MAKING REGARDING NON-ECONOMIC VALUES.

3. **Comments on the classification of values**

Many of these values can be estimated using a variety of techniques, assuming that the data are available to quantify the basic physical/biological relationships involved. Unfortunately, in most cases there are vast gaps in our understanding of these physical/biological relationships, e.g., in the case of the forest's role in the carbon cycle and how to specify what contribution a specific area of forest makes as a sink for greenhouse gases. Without such information, the economist cannot proceed to develop value measures.

Further, in the case of the value of biodiversity, and particularly the value of biodiversity contained in a specific forest area, the economist faces almost complete uncertainty. It simply cannot be known what the future holds, when another medicinal plant of interest to the chemical industry such as the rosy periwinkle will emerge and what its value will be in terms of the contribution of the forest. Thus, useful economic values cannot be attached to such potential outputs from the forest.

In sum, we are dealing with a very complex situation, because of: I) the dynamic and interactive nature of forests and their outputs; and, II) the relative nature of

economic values, both in terms of varying supply and demand conditions over time and in different locations, and in terms of the varying value perspectives of different decisionmakers who actually will decide the fate of a given forest.

4. **Conclusions**

The complexity of the problems involved, and the present poor state of the actual valuation experience with natural forests, should not discourage the world community from pushing ahead with a number of actions to improve the situation. Specifically, further research will be necessary to:

a) quantify the multiple outputs (goods and services)which are being and could be derived from specific natural forest conditions; this includes quantification of supply and demand conditions for such goods and services and the market prices and non-market derived values associated with them;

b) understand who benefits from and who pays for various uses of forests, i.e., the distribution of costs and benefits involved in different forest uses (including, of course, protection as one use);

c) analyze the value paradigms implicitly and explicitly used by the various decisionmakers making the actual decisions concerning the fate of the forest;

d) develop and implement rationales for decision-making that complement the economic value approach to decision-making regarding forest uses, recognizing that relative economic values provide only one part of information needed for decision-making.

SECTION V

Socio-economic Impact on Timber Exporting Countries of Restrictions and Bans on Imports of Timber and Timber Products

Restrictions and bans on the exploitation of selected forest resources exist all over the world at a national and international level. Earlier in history these have very often been based on restrictions imposed by the owner (government or private) or on religious and management-based reasons (protection of watersheds or sensitive areas). Grazing and exploitation of forest has more often than not been subject to regulatory mandates by local authorities.

Measures oriented towards controlling or restricting trade are labelled trade

barriers and include a series of mechanisms such as law, policy or practice including special tariffs, quantitative restrictions on exports or imports, licensing requirements, minimum pricing regulations, embargoes, prior deposits, special standards, and customs and administrative entry procedures.

Several examples of these mechanisms affecting forest products can be found in developed as well as in developing countries.

In most cases, these measures are taken to protect local conditions such as employment or to increase added value to exports in the producing country or to favour locally produced goods in the importing country. Some of these regulations can, however, have their base on more global concerns such as the restrictions or bans derived, for example, from the Convention on International Trade of Endangered Species (CITES).

In some cases trade barriers can be oriented towards favouring a region or a range of products, and based on general policies of the country or group of countries establishing such regulations.

For example, unprocessed logs cannot be exported from federal lands in the USA. In Canada, provincial laws prohibit the export of any logs that could be processed by domestic agents. Forestry subsidies in Japan tend to artificially depress domestic log prices. For many years up to the early 1970s Chile did not allow the export of unprocessed logs, while subsequent reversal of this regulation helped encourage development of the forestry sector.

In the last few years some relatively stringent measures have been proposed to reduce or stop unsustainable forms of forest exploitation. These proposals, advocated mainly by non-governmental organizations, include the banning of imports of timber and timber products by consumer countries, or the restriction of imports to those products produced solely under sustainable management. These proposals are perceived by the advocates as a means of protecting tropical forest ecosystems. Some of them have been supported by an increasing number of groups in the developed world and criticized by Governments and official organizations, both in the developed and developing countries. The ITTO Council, for example, and the FAO Committee for Forest Development in the Tropics (CFDT) strongly criticized this approach. As a reaction to restrictions and bans on the use of tropical timber in several districts in Germany, the German Federation of Tropical Timber Importers developed a set of criteria and a Code of Ethics to be used by its members.

Even though a global position on this approach has not been developed, advocates for bans and restrictions base their positions on the effects of logging on forests and local populations. They underline the loss of biological diversity, the effects on soils, the disruption of local communities, and the benefits which would derive from the conservation of forests.

Opponents to the measures tend to highlight the revenues in local and hard currency resulting from logging and exporting of timber, the employment opportunities and the consequences of forest land being converted to other land uses if these restrictions do not allow the forest products to reach appropriate markets. Opponents also point out that logging activities are not the main cause of forest destruction, and that exports only account for a small proportion of total wood usage.

In practical terms, issues would be better considered in a case by case approach. The local social, economic and environmental aspects are often being hidden when global and very often incomplete statistics which do not reflect complex local realities are used. It would appear that a broader approach oriented to promote better management and conservation of forests geared towards sustainable management may be more acceptable to all parties involved.

The wide range of mechanisms and their varied effects on different sectors of the economy and on the social structures makes it difficult to develop a more comprehensive view in the context of this report. Several organizations, among them, FAO, ITTO and UNCTAD, have been studying the different measures and their effects and it would be advisable to expand analysis to include coverage of the social effects. Furthermore, the result of the discussions on trade restrictions under GATT may have a significant effect on the approaches to be taken in the future.

SECTION VI

Main Recent Outcome of Discussions and Reports

1. Introduction

It would be cumbersome to refer to all discussions and reports produced by various International organizations related to forestry as some of the organizations have been working on this subject for over 40 years. The report will, therefore, concentrate on the recent major issues related to the present and future situation of forests and forestry some of which are to be seen from a perspective covering a period of nearly one decade.

2. Food and Agriculture Organization (FAO)

Forestry was introduced into FAO in 1946, one year after its foundation, and in 1970 the Forestry Division was upgraded into a full technical Department. FAO is the UN specialized agency responsible for the collection, analysis and dissemination of information on all aspects of forestry and primary forest products and the principal

multilateral agency for technical assistance in forestry to the developing countries playing an important role in stimulating forest and tree based development.

The 158 FAO member countries govern the activities of the Organization through the Conference and Council, which receive advice on forestry matter from the Committee on Forestry (COFO). The latter is the highest intergovernmental body dealing with the whole array of forest matter worldwide and it conducts periodic reviews of international forestry problems and proposes co-ordinated actions for their resolution. The Committee on Forest Development in the Tropics (CFDT) with a membership of tropical as well as other countries, studies technical, economic and social issues relating to the development of tropical forests, having regard to production, utilization and conservation aspects. It also reviews international programmes in tropical forestry in order to study and report on the harmonization of such programmes and the concerted actions that governments and international organizations could take to ensure rational tropical forest development and utilization.

Six regional forestry commissions--for Africa, Asia, Europe, Latin America and the Caribbean, Near East and North America--and the Committee on the Mediterranean Forestry Questions--Silva Mediterranea--advise on the formulation of forest policy and co-ordinate its implementation at the regional level. In addition, five other technical bodies and expert panels, as well as subsidiary bodies of the regional forestry commissions advise in specific subject matters at global or regional levels, in such fields as education, research, forest genetic resources, wildlife, panel products and pulp paper.

The Forestry Department collates data relevant to forests and forestry from every part of the world which is analyzed, processed and summarized in such publications as Yearbook of Forests Products, UNASYLVA, monthly bulletins, technical and economic reviews. The technical staff (75 professional positions mostly at HQ and some in FAO regional offices and joint divisions with other agencies) is also providing technical advice through preparation of status reports and manuals, sector studies, field project development and technical backstopping. FAO organizes, jointly with host countries the World Forestry Congresses.

The FAO Forestry Department provides technical assistance through implementation of projects financed by bilateral and multilateral sources. The present programme involves some 320 projects in 90 countries and the engagement of 690 FAO staff (including consultants) and at an estimated disbursement in 1991 of US$68 million. The current total value of the approved field programme is US$353 million.

The Tropical Forestry Action Plan (TFAP)

In the early 1980s, FAO and UNEP produced a comprehensive assessment of tropical forests which constituted the basis for an official alarm regarding deforestation in tropical countries. Concerned with the rate of destruction of tropical forests and its

consequences, but at the same time recognizing the potential of those forests to contribute to socio-economic development, FAO at the request of the CFDT, together with the World Bank, UNDP and WRI, launched the Tropical Forestry Action Plan in June 1985. The Plan was subsequently endorsed by a number of international meetings and the FAO Conference (Rome, November 1985). The Plan provides a framework for actions at national, regional and global levels in tropical forestry. The Plan has received strong support from multilateral and bilateral assistance organizations. During the past 5 years, 81 countries representing 90 per cent of the tropical forest area (Brazil excluded), have adopted the TFAP, with only 20 such countries still to join. However, criticism has also been voiced, particularly from non-governmental organizations who perceive that insufficient attention has ben given to environmental issues such as climate change and biodiversity, involvement of local communities and effective cross-sectoral approaches. In order to assess the situation, FAO appointed an Independent Review Team, which in its report confirmed some of these problems and suggested several measures for its re-orientation. The Independent Review proposed among other measures to make TFAP more country-driven and process-oriented. It also recommended to initiate the preparation of an international convention on the conservation and development of the world's forests.

The FAO Committee on Forestry at its 10th session in September 1990, recommended to increase the efficiency of the TFAP, particularly through strengthening national capabilities. It supported the concept of an international instrument on the conservation and development of forests. The Committee further agreed that FAO continue its efforts to contribute to the preparation of the legal and technical scope and content of such an instrument in close collaboration with the UNCED Secretariat and international organizations concerned.

The FAO Council at its November 1990 98th session, endorsed the concept of an international instrument on the conservation and development of forests and requested that this issue be referred to its next session in June 1991 for further consideration of action to be taken in the light of developments
in other international fora.

3. The International Tropical Timber Organization (ITTO)

The ITTO was established by the International Tropical Timber Agreement, 1983, under the auspices of the United Nations Conference on Trade and Development (UNCTAD). Although established by the United Nations, the ITTO is an intergovernmental organization outside the UN system. Members consist of 22 developing producing countries having sovereignty over 70 per cent of the global tropical forests, and 24 mainly developed consuming countries. The International Tropical Timber Agreement (ITTA) is the only existing agreement on the tropical forests although the commodity aspect is its main theme. Because the Agreement gave prominence to the environmental aspects of the need to maintain the ecological balance and to encourage the development of national policies aimed at sustainable utilization and conservation

of tropical forests for timber production, the ITTO is perceived as an organization which may play a further significant and effective role in the promotion of sustainable development of the tropical forests. This role is borne out by the development and evolution of the ratios between its projects in the three main divisions of its objectives, thus 70 per cent of its projects are in the field of reforestation and forest development, 20 per cent in that of forest industry and 10 per cent in the field of economic information and market intelligence. Its published guidelines on sustainable management of the tropical forests for timber production serves to fill a well known need and may possibly have the effect of extending the establishment of sustainable development in many tropical forest countries.

The ITTO is an institution dealing with tropical forest matters not limited to the commodity aspects. Its three Permanent Committees in which technical details are worked out on project appraisal and assessment, while policies of political significance are dealt with in the Council consisting of all member countries, namely, the developing countries with the resources, and the developed countries, which are the potential donors to help implement, *inter alia*, in sustainable management projects. The ITTA could be a useful example to consider in the institutional aspects relating to the utilization care and protection of the world's tropical forests. The ITTA is due to be renegotiated by 1994 at the latest, when it is thought that the original agreement might be modified to better serve the ITTO's evolutionary development and the tropical forest as well, in close cooperation with existing agencies in this field.

4. UNEP, WMO-IPCC - Second World Climate Conference

In the context of the 1990 Second World Climate Conference the Ministers declared that they recognized that forests and forest products play a key social and economic role in many nations and communities. They also recognized the sovereign right of States to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause a damage to the environment of other States or of areas beyond the limits of national jurisdiction.

They also noted that the conservation of the world's forests in their role as reservoirs of carbon, along with other measures are of considerable importance for global climate stability, keeping in mind the important role of forests in the conservation of biological diversity and the protection of soil stability and of the hydrological system. They further recognized the need to reduce the rate of deforestation in accordance with the objective of sustained yield development and to enhance the potential of the world's forests through improved management of existing forests and through rigorous programmes of reforestation and afforestation. They also recommended that the protection and management of boreal, temperate, sub-tropical and tropical ecosystems be well co-ordinated and preferably compatible with other possible types of action related to reduction of emission of greenhouse gases, rational utilization of biological, provision of financial resources and the need for more favourable market conditions for

timber and timber products. The developing countries should they declare, be able to realize increased revenue from these forests and forests products.

Forest Research

Research in the forest sector has been developed in national institutions in developed and developing countries as well as in some regional and international organizations such as FAO, UNESCO, IVFRO and others. However, during the late 1980s, it was felt necessary to increase the level of action and funding to further support forest related research worldwide.

Several recommendations were made in this sense following the Bellagio meeting on Forest Research which were then considered within the context of the Consultative Group of International Agricultural Research (CGIAR).

General support for the incorporation of Forestry into the CGIAR system was then given at the International Centres Week, held in Washington, D.C. (October/November 1989 - ICW/89). Following a series of meetings in Rome, in March 1990 the Technical Advisory Committee (TAC) put forward a suggested institutional approach to the incorporation of forestry and agro-forestry into the CGIAR system.

A working group of five representatives of donor governments and agencies has been formed by the CGIAR to examine the implications of the decisions taken and to report to the mid-term meeting of the CGIAR in May 1991.

SECTION VII

Potential Areas for Action

General Consideration

Decision 1/14 taken at the Second Session of the Preparatory Committee requires the identification of options for the coordination of national, regional and international action. These options have to be identified in the context of certain basic features for forests and forestry activities which are listed below:

1. Forests are a resource which provide the basis for economic development and a livelihood for many people. There is a need to protect, conserve or exploit forest areas to provide a sustainable livelihood for forest dwellers.

2. Forests compete with other uses of land. For example, agriculture, settlements, mining and industry. Policies and measures that contain the growth and the

requirements of land for these other uses could have a favourable effect on forest conservation. Measures which raise sharply the productivity of land in existing agricultural areas will help to reduce the pressure for crop land on forests.

3. The quality of forest cover also depends on what is happening in other sectors. For example, the impact of energy production and consumption and pollution control measures on acid deposition has a direct effect on forest cover. Equally, the economic benefits associated with the demand for forest products influences the harvesting and replanting practices of forests and hence affects the quality of forest cover.

4. The extent and quality of forest cover involves large externalities. For example, degradation or removal of the forest cover will accelerate soil erosion in many areas and, through that, increase sedimentation in rivers, lakes, and reservoirs. It affects the productivity of agriculture, the capacity of conserving wildlife habitats, the sustainability of upland settlements, etc. It has many other external effects, often of a regional or even global character including changes in the storage of greenhouse gases.

5. The full benefits of forests are seldom appropriated by those who bear the costs of maintaining and protecting forests. In particular, the externalities often involve benefits to parties who do not bear any part of the cost of protecting forests. Equally, the reverse holds that the costs of deforestation are often borne by those who do not benefit from the short-term returns which may arise from deforestation. This divergence between private and social costs and returns means that market prices of forest products or forest land do not necessarily give the correct signals.

6. The production period for forestry is much longer than for normal commercial activities. There is a growing period during which no returns can be expected and beyond that the return is spread over many decades. Standard systems of commercial finance are not geared for this type of long-term need.

Given the perspective outlined above, it follows that forestry activities cannot be designated or implemented purely as a sectoral matter. The institutional arrangements for forest policy and planning at the national level must integrate forestry with other land use activities, particularly agriculture. This carries with it, of course, the risk that pressures for land for other uses may dominate over the imperatives of forest conservation. But it is equally possible to argue that an integrated view of forests and other uses of land could lead to a situation where the policy framework for other land uses has to take into account specific objectives and targets set for forestry.

The integration of land use management in one organization is, of course, by itself not enough. It has to be accompanied by the development of appropriate methodologies for land capability analysis and balancing of different objectives.

The departure from the sectoral approach has to be matched by some important changes including the financing of forestry activities. Forestry requires financial resources which have a significant grant element since much of the benefit of forests are not appropriated by those who bear the costs of reforestation and forestry management. Second, it must involve a long initial grace period since whatever returns can be expected from forests will not arise for quite a few years. Third, it must be relatively long-term in nature because the returns from forests stretch over a substantial period of time.

Forests cannot be managed solely from the supply side. The pressure on forests also arises from the demand for timber and other forest products. The management of demand and trading conditions in forest products is as important. This would require an examination of implicit or explicit subsidies, tariff structures, policies regarding substitutes for forest products, etc.

Many of the factors mentioned above involve causes and effects which transcend national boundaries and are regional in character. Much of what was said on integrating forestry into a broader framework of land use and the need for long term finance is very relevant in designing workable systems of regional co-operation. In certain respects, the external effects of forests, particularly with regard to climate, are really global in nature and the same propositions are relevant at the international level.

It is in this context and taking into consideration the issues referred to above and the negotiations actually taking place in relation with forests and other related matters that these suggestions are made.

Action at national level

Assessment and evaluation

A basic principle of adequate economic management is to have appropriate information on the volume and distribution of the resources available. In co-ordination with existing international mechanisms for forest resources assessment, countries should improve their own capacity to carry out forest assessment and evaluation. These should not only focus on the forest cover and timber production, but also include detailed information on forest types, flora and fauna composition and distribution, biomass productivity, wildlife, fuelwood, timber, naval stores, etc.

Conservation and development

Forest management is not necessarily a synonym of physical intervention in a forest range. The natural forest areas should be assessed in accordance with their specific capacity and areas designed for different purposes should be identified for

example for full protection, scientific research, and for different levels and types of utilization. This should be co-ordinated with afforestation and reforestation programmes compatible with the local cultural, economical and environmental needs within the context of rural development planning. It should also include the promotion of some new areas of action such as agro-forestry practices and urban greening, as well as programmes of conservation of forest genetic resources. Forest plantations responding to specific demands will help in reducing the pressure on sensitive natural forest ecosystems.

Particular attention should be given to the use of marginal agricultural lands, sensitive areas such as mountains ranges, watersheds and coastal areas and to the recovery of highly degraded lands. Afforestation and reforestation schemes should be compatible and co-ordinated with other land uses such as food and fodder production, human settlements and communications infrastructure.

Programmes should be, whenever possible, developed with the fullest participation of the populations from the community or district level up to the provincial, regional and national level. Appropriate consideration should be given to the agro-ecological conditions and to the local markets and trade patterns. Governments may wish to consider the establishment of specific targets to arrest and reverse deforestation and ensure conservation and development of forests.

Action at the international level

Co-ordination

During the last two decades, but particularly in the last five years, the world has witnessed a significant increase in concern for and action on forests. Several United Nations agencies and organizations, bilateral and multilateral agencies, intergovernmental bodies and non-governmental organizations have developed their activities and assistance towards the conservation, management and development of forests, the trade of its products and the financial support of regional or national activities. In a few cases, additional mechanisms have been developed, formally or informally, for the co-ordination of some specific areas within or among these programmes, for example, the Ecosystem Conservation Group which includes FAO, IUCN, UNEP, UNESCO and more recently UNDP and WWF; the Tropical Forestry Action Plan Forest Advisors Group which bring together UN agencies and organizations, bilateral and multilateral funding organizations, recipient countries and non-governmental organizations. Furthermore, FAO has two intergovernmental committees: the Committee on Forestry (COFO) and the Committee on Forest Development in the Tropics (CFDT) which provide an advisory mechanism to harmonize the development of efforts and activities towards the forestry programme of the organization. The System Wide Medium Term Environment Programme launched by UNEP constitutes another approach. There is, nevertheless, a need for a better and effective co-ordination.

In particular, the approaches followed on the negotiations on the climate convention and the convention on biological diversity must be harmonized with any potential instrument on forests.

Financing Forest Conservation and Development

Any given international mechanism for the promotion of forest conservation and development will need to consider appropriate solutions for the provision of financial support. In 1987, FAO estimated that the amount of financial needs for forest development in developing countries reached a figure between 13 and 17 billion dollars per year. A survey carried out in 1988 on the level of Official Development Assistance (ODA) for forestry showed that it amounted, during that year, to about US$1.1 billion. An important issue is the mechanism required for bridging the gap between the needs and the availability of resources.

The Preparatory Committee may wish to consider this matter in the context of the discussions on financial resources.

International Legal Instrument

In June 1990, in Dublin, the European Council requested the Commission to analyze and elaborate proposals for an appropriate Community programme to deal with the threat to the tropical rain forest in consultation with the concerned countries and in particular with Brazil.

The Group of Seven in its Houston Declaration in July 1990 called for negotiations "to begin expeditiously and be completed by 1992 on a global forest convention or agreement to curb deforestation, protect biodiversity, stimulate positive forestry actions and address threats to the world's forests".

Following the recommendations of the Independent Review Team on the Tropical Forest Action Plan to the Director General of FAO, this organization took some steps to develop further work on this approach. While analyzing these developments the FAO Committee on Forestry (September 1990) and the FAO Council (November 1990) endorsed the concept of an international instrument on the conservation and development of forests. It was the view of some members that any eventual instrument on forests ought to be complementary with other initiatives currently on the way and progress on any one instrument ought not to impede progress on the others. The FAO Council requested that the question of an international instrument on the conservation and development of forests be referred to the next session of the Council in June 1991 for further considerations of actions to be taken by FAO in the light of developments in other international fora.

The Preparatory Committee may wish to consider discussing the development of an international legal instrument for the conservation and development of forests. It may wish to discuss how an instrument of this sort could provide the mechanism to address the rate of deforestation which is affecting in particular all developing countries in temperate and tropical regions while including aspects of conservation and management of forests in developed and developing countries.

An international legal instrument for the conservation and development of forests should:

- fully integrate all aspects of environmental protection and economic development as they relate to all forests whether boreal, temperate or tropical.

- ensure a vital increase in international co-operation for policies and programmes aimed at forest conservation and sustainable use.

- complement other international initiatives with implications for aspects of forestry, notably the climate change and biodiversity conventions.

- ensure the incorporation of the concept of sustainable management of forests and its relation with food, fuel, shelter and timber.

- provide a framework for increased national efforts and bring together both the ecological and economic approaches to the use of forest resources

- it should provide a mechanism to monitor its implementation, to assess progress and to co-ordinate international action.

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CONSERVATION OF BIOLOGICAL DIVERSITY

Progress Report of the Secretary-General of the Conference

I. INTRODUCTION

1. The Preparatory Committee, at its first substantive session, in decision 1/16 requested the Secretary-General to examine and report to the Second Session on the Status of the negotiations of an international legal instrument on biological diversity concerning the protection of biological diversity and the rational use of biological resources within a broad socio-economic context, to analyse the results achieved and to make recommendations thereon. 1/

2. Biological diversity is fundamental to human life. It is a basic feature of the way in which living organisms are structured. As such, it provides support for ecosystems, for the regulation of water and the atmosphere and the basis for agricultural production. When genetic variations are lost, therefore, not only are specific and potential properties and adaptations also lost, but with them species are diminished, ecosystems are impaired and the ability to sustain human life is damaged.

3. Biological and genetic resources have an inestimable value which is nevertheless difficult to quantify in economic terms. Like the atmosphere and the waters of the Earth, biological diversity has been largely taken for granted as a free good. Individual species have acquired commercial value in

varying degrees as sources of pharmaceutical and other commercially-marketed products and genetic material for breeding of food crops. But only recently has there been a growing awareness of the indispensable value of the ecological systems, of which tropical forests are a notable example, which provide the sources and storehouses of these resources. It is essential that these values be much more fully recognized so that the costs of conserving and developing them sustainably is seen as a better alternative in economic as well as environmental terms to allowing them to be destroyed through unsustainable development practices.

4. Biodiversity is only one feature of an entire collection of individual and quite different elements which are continuously evolving and adapting. Biodiversity itself cannot be preserved as a fixed property or entity. Ensuring the continuing productivity of the biosphere for current and future generations presents major problems. It requires as a first step specifying the ways in which biodiversity is influenced by human activity, and the objectives for its use and conservation.

5. In this report the Secretary-General of the Conference has:

(i) Provided an account of the progress of negotiations on an international legal instrument for conserving biodiversity; and

(ii) Suggested a number of potential areas for action, which the Preparatory Committee is invited to consider.

6. In preparing this report, the Secretary-General of the Conference has worked closely with the relevant agencies of the United Nations system, from whom useful suggestions and contributions have been received and duly reflected. In particular, assistance and advice were received from members of the Ecosystem Conservation Group; the United Nations Environment Programme; the Food and Agriculture Organization; the United Nations Educational, Scientific and Cultural Organization; the United Nations Development Programme; the International Union for Conservation of Nature and Natural Resources; the World Resources Institute; the World Wildlife Fund; as well as from the International Union of Biological Science. The members of the informal ad hoc Working Party on Biodiversity also provided very useful help in the preparation of the report and the work of the secretariat.

II. STATUS OF NEGOTIATIONS ON AN INTERNATIONAL LEGAL INSTRUMENT

7. Following three sessions of the ad hoc Working Group of Experts on Biological Diversity, the United Nations Environment Programme (UNEP) convened the first meeting of the ad hoc Working Group of Legal and Technical Experts in Nairobi on 19-23 November 1990. This was attended by experts from 70 countries, including 52 developing countries, with observers from 8 United Nations bodies and specialized agencies and 5 international organizations. 2/

8. The Chairman of the ad hoc Working Group of Experts on Biological Diversity summarized the results of the first three meetings as follows:

- the urgent need for a new international legal instrument had been identified;

- there was agreement that biological diversity and its related technologies were complementary and that this should be reflected in the instrument;

- concern existed that commitments to funding would not be fulfilled, and would render the instrument meaningless.

9. The meeting of the ad hoc Working Group of Legal and Technical Experts discussed a number of issues for possible inclusion in a global framework legal instrument.

Fundamental principles

10. A number of guiding principles were identified, including the following:

- the concepts of the common concern of humankind 3/ and of the sharing of benefits should be explored further in relation to biological diversity;

- mutual agreement between countries should form the basis of access to natural resources;

- the interdependence of biological diversity and biotechnology should be recognized; and

- the legal instrument should be compatible with the International Undertaking on Plant and Genetic Resources.

11. It was also suggested that the preventive and precautionary approach, as well as the Polluter Pays Principle, should be taken into account; that a new multilateral fund should be established; that developing countries should benefit from research and development based on biomaterial taken from their countries; that the conservation of biological diversity should be remunerated; that indigenous peoples should be rewarded in some way for innovation; and that a clear distinction should be made between the obligations and responsibilities of developed and developing counties.

General obligations

12. A number of general obligations were identified directed mainly at furthering co-operation, restricting harmful activities, and addressing the special needs of developing countries. These included:

- taking appropriate steps to conserve and restore biological diversity at the national and international levels;

- curbing action potentially harmful to biological diversity in areas and States beyond national jurisdiction, using environmental impact assessment whenever appropriate;

- developing policies, strategies and programmes for the sustainable utilization of biological resources;

- aiming to achieve the objectives of the convention through co-operation.

Measures for Conservation and Sustainable Utilization of Biological Diversity

13. Among the measures discussed were:

- the need for a better reflection of the balance between the benefits and burdens associated with the conservation of biological diversity;

- the need for implementation in accordance with national priorities and plans, possibly by means of national biological diversity strategies;

- the relative merits of and inherent links between in situ conservation and ex situ conservation (which should be undertaken in the countries of origin of biological diversity);

- the need to create special economic development areas around protected areas with measures for in situ conservation implemented by national bodies; and

- the need for improved research facilities in developing countries; better education and public awareness measures; and the establishment of more natural history museums for ex situ conservation.

Availability of access to biological diversity technology and information thereon/transfer of technology for the conservation and utilization of biological diversity/technical assistance to developing countries

14. Views expressed suggested that:

- the approach to the transfer of technology should be based either on a preferential and non-commercial basis or on the notion of "fair and equal" exchange of technology;

- since States do not own the major part of technology and cannot intervene to direct the private sector, the elaboration of provisions for the transfer of technology to developing countries would be cumbersome. In any case, property rights were already dealt with by organizations such as GATT and WIPO;

- but developed countries should in any case develop a mechanism for transferring technology from the private sector.

Protocols and international co-operation

15. Discussion of Protocols was thought premature by some. The Ecosystem Conservation Group are developing a set of general principles and guidelines for country case studies (nine so far proposed).

Organization of work

16. The bureau for the negotiating process would be elected by the negotiating body at its next meeting in February 1991. It was aimed to have the convention ready by 1992.

Next steps

17. The UNEP secretariat is to prepare the draft convention based upon the ad hoc Working Group Meetings. The secretariat would include all the options presented by different delegations. The final draft convention is to be distributed in United Nations languages to Governments at least one month before the next meeting of the ad hoc Working Group.

III. POTENTIAL AREAS FOR ACTION

18. Conserving biodiversity will call for the development and implementation of a comprehensive response involving a wide range of in situ and ex situ activities; in protected and outside protected areas, at local, national, and international levels. Any package of measures to save, study and utilize the world's biodiversity in a sustainable manner should draw upon, reinforce and supplement ongoing and planned activities of United Nations agencies, in particular the FAO, UNESCO, UNEP, UNIDO, UNDP and non-governmental organizations such as IUCN, WRI, WWF and IUBS. The Preparatory Committee may wish to consider the following potential areas of action:

(i) Integrating biodiversity and development policies, planning and projects

19. Maintenance, knowledge and understanding of species, genes and ecosystems and their sustainable management for ethical, cultural and material purposes depends, in practical terms, upon the extent to which goals and objectives are integrated with development policies. Integration of biodiversity and development can take place through development instruments, including land use planning, marine and coastal zone planning, forest management plans and formulating and implementing national biodiversity strategies. Project planning by local authorities, national ministries and agencies, and development aid institutions can incorporate steps to determine goals and means for maintaining key sites, species and genes, investing in research, inventory and assessment, and in options in forestry, agriculture, fisheries and wildlife management.

Activities to foster integration might include:

- preparation of quantified case studies to demonstrate the interdependence of various sectors (e.g. industry, agriculture, fisheries, forestry) for enhancing the productivity of ecosystems and mitigating damage to biodiversity;

- assessment of the relationship between per capita income and the utilization of "wild" natural resources to determine the dependence of the rural poor on biodiversity; and

- development of methodologies for determining and establishing national development objectives to conserve biodiversity.

(ii) Identifying policies to conserve biodiversity

20. Policies, including international policies, that promote the conservation and enhancement of biodiversity need to be identified and methodologies to assess the impacts of such policies and ways of rendering them more sympathetic to the conservation of biodiversity developed. The factors to be considered include the following:

- biodiversity conservation and development require a favourable policy and legislative context, whereas existing policies and laws have normally been established for other purposes under different economic and historic conditions;

- subsidies often promote farming on poor or marginal soils, timber harvesting methods which disregard future tree growth, road building which opens wilderness tracts to spontaneous colonization, and overfishing. Incentives can be designed to foster longer term considerations in forestry, agriculture and fishing, and to ensure future yields, allowing in turn for ecologically sensitive sites to be protected, watersheds to be maintained, and seed supplies for local interest to be retained;

- biodiversity has links with foreign policy-making. For example, under the World Charter for Nature, nations are called upon to consider their responsibilities to the global community and to future generations regarding species, genes and ecosystems by ensuring their continuity and productivity; and

- governments, particularly in developing countries, should be assisted to elaborate legislation for the protection of their biodiversity. Incentives and concessions to foster implementation and compliance will be suggested.

(iii) Promoting regional approaches to conservation

21. The application of biodiversity conservation by means of micro-scale projects within national parks and through endangered species rescue while central to biodiversity conservation entails fundamental problems of scale. Plants, animals and landscapes/seascapes the world over have been influenced and shaped by humans through hunting and gathering, fire, agriculture, gardening, forestry, fishing, and more recently through pollution, mining, and urban development.

22. The array of species and genes to be conserved is currently found not only in wildlands but in forest stands harvested for timber and other products, grazing fields, croplands, and near villages and urban centres. Ecosystem functions, including the cycle of nutrients, the disposal of wastes, the flow of streams and groundwater occur over large areas. Management is therefore needed at the regional level on land and in the sea. Ideal units include river basins or watersheds, mountain areas and marine bodies and their coastal zones.

23. The concept of ecoregions aimed at establishing mechanisms to deal with ecologically homogenous areas that transcend national boundaries needs to be developed, through:

- more case studies, lessons learned, guidelines, and demonstration programmes. Mainstream conservation typically involves relatively large areas of land, within which a protected area is only one element. There are as yet few good examples of "ecoregion management".

- the application of administrative and managerial structures to the concept of ecoregions needs to be examined, and the co-ordination of highly diverse activities over a fairly large area and the responsibilities of different levels of government addressed. The possible contribution of local communities need to be identified. For example, resource management responsibilities might be concentrated at the most local possible level, with higher levels of government responsible for setting and enforcing standards, facilitating trade, and other policy decisions.

(iv) Consolidating protected area network

24. The maintenance of species, genes and ecosystems requires the application of many different conservation measures, selected according to particular circumstances. Protected areas are fundamental to the maintenance and protection of endemic plants, sources of plants or animal material of value to agriculture and forestry germplasm, as well as for the conservation of marine biodiversity. However, protected areas should be supplemented by a variety of other policies to protect wider areas under human use. Factors to consider include:

- the need to consolidate regional and global networks of protected terrestrial coastal and marine areas, the development of a global protection and management strategy, and the elaboration of mechanisms for strengthening existing networks and including more protected areas, as well as ensuring the participation of local population in their management;

- the identification of the highest priorities for improving the management of existing protected areas. While all protected areas need to be managed well, some are so important internationally that they merit support from the international community. Similarly, the highest priorities for establishing new protected areas need to be identified to help facilitate the establishment of such areas and the provision of the necessary investment;

- the need to improve the management capacity of protected area agencies. A wide range of specific activities for the improvement of management capacity is expected to be carried out in preparation for the Fourth World Congress on National Parks and Protected Areas. Protected area management practices, based on practical field experience, have to be analysed and appropriate policies recommended.

(v) Strengthening ex-situ conservation of species and genetic resources

25. Measures to conserve plant and animal biodiversity include ex situ methods, such as zoos, botanic gardens, captive breeding stations, seed banks, germplasm storage facilities, as well as biotechnology applications such as tissue culture, protoplast fusion, embryo transfer and cryopreservation.

Of the approximately 1,300 botanic gardens worldwide the majority are located in northern temperate latitudes, leaving the most endangered ecosystems in tropical moist forests with the least access to these vital services.

Seed banks also play an important role in ex situ conservation, although some plant species propagate best by vegetative means.

Captive propagation and wildlife reserves are major approaches used for animals, which may help preserve some genetic diversity found in wild relatives of domesticated species, helping to improve pest or disease resistance as well as other desirable characteristics.

The application of biotechnology could also contribute to the ex situ conservation of plant and animals.

There is a need to strengthen and increase the linkages between in situ and ex situ conservation, as well as the use of the whole range of techniques for ex situ conservation. Some of the activities that should be undertaken include:

- a co-ordinated undertaking worldwide to increase collections of biological samples in museum and herbaria;

- better use of new cataloguing methods and more efficient use of personnel in these institutions;

- promoting of curating collections;

- promoting more botanical gardens in tropical regions;

- promoting seed collections for wider variety of plants;

- review of biotechnology applications that could be used to increase plant and animal conservation.

(vi) Enhancing knowledge and information

26. There is a need to develop our understanding on how life in its many manifestations functions. As a first step the elements with which we work need to be described and catalogued. We need to know how much diversity exists and how important it is to retain it. In practical terms the policy and decision-making needs of governments, industry, research establishments, academia, etc., require information on the basic composition, structure and function of ecosystems and on the plants and animals they contain.

27. The extent of the available knowledge varies enormously from the temperate and arctic areas, where it is reasonably acceptable, to tropical areas and marine aquatic environments, where it needs to be improved. Possible steps to remedy this situation might include:

- the development of new and more imaginative methods of cataloguing, which makes imaginative use of non-scientific personnel ("parataxonomists") and of modern computer methods, though for a general inventory of the world's biodiversity the scientific community would still have to be involved;

- the development of sampling methods: the number of species (especially of invertebrates and marine organisms) is so high that carefully describing each may not be a realistic goal. By establishing a global sampling grid to estimate the world's diversity, through an inventory (i.e. how many species exist) and a survey (i.e. how is the diversity distributed) and with proper organization and modest funding, a reasonably precise estimate of the diversity of species and ecosystems of the world could be obtained in 5 to 10 years;

- the compilation of an inventory of traditional knowledge systems highlighting those aspects which can contribute to conservation and development. Special attention would need to be given to the identification of traditional knowledge systems that are endangered;

- the provision of financial and technical resources to enable indigenous people to conduct their own research. The aim should be to create an indigenous scientific community that includes both traditional expertise and acquired scientific skills and procedures.

- support for the wider dissemination of knowledge on biodiversity. The available information also needs to be made more accessible to those who require it, in a form they can apply to real management problems. Modern information technology could provide an important mechanism to make information more widely and readily available.

(vii) Developing the capacity to monitor and audit

28. The selection of goals and objectives for biodiversity conservation and development and subsequent decisive action require clear indicators to measure response to management and investment. Numerous schemes exist for measuring components of biodiversity, but they do not adequately serve the needs of policy-makers or the objectives of biodiversity conservation. Policy-relevant measurements of biodiversity and the objectives for conserving biodiversity are interlinked. Among the steps which might be considered are:

- the monitoring of biodiversity should be closely linked to the monitoring of crop productivity and climate to detect inefficient land-use practices or climatic or other change;

- much more work is needed on methodologies for monitoring land use changes by satellite, especially in correlating satellite observations to changes in biota. Biosphere reserves, which combine protected areas with areas under management, are particularly suitable as earth-based observatories in combination with satellite observations;

- a system to verify and evaluate the monitoring and auditing of the preservation of biodiversity is needed. Sophisticated monitoring systems will take some years to be put in place: indicators are required to enable approximate monitoring to take place;

- the status and trends of forest management need to be monitored including accurate and objective assessment of the rate of loss of forests;

- other ecosystems and specific areas also need to be monitored to assess their status and trends, using certain key and critical species as diagnostic indicators of the adequacy of the protected area.

29. For these observations to make sense they have to be based on scientific analysis. Change is a characteristic of biological systems, so it is necessary to be able to distinguish random or cyclical change from systematic change caused by human activities, as well as from those activities which increase land productivity, and those that decrease it. These links therefore will also be developed in this component.

(viii) Promoting education and training

30. Developing the necessary human resources is critical for the effective planning and implementation of biodiversity policies, strategies and programmes. There is a need for education at the level of the general public, for education at the tertiary university level, for training of specialists, and for training of managers. Particular consideration could be given to:

- the development of local curricula on biodiversity. Most countries have focused on national educational curricula, but local knowledge on biodiversity and its preservation is being lost. Action is therefore required to show how local knowledge can be incorporated into the curricula of schools in rural regions, though the importance of the regional and international approaches to education and training should also be borne carefully in mind; and

- an assessment of the manpower requirements for the conservation of biodiversity. Modern comprehensive approaches to conserving biodiversity may require more sophisticated managers. Their number and the information they will need to know also needs to be determined, as does the local knowledge needed to support development appropriate to the specific setting.

(ix) Improving the international trading system to promote biodiversity

31. The discussions and negotiations now taking place over intellectual property rights and genetic resources reflect a positive new thrust in international conservation. They also reflect the growing awareness of the potential values of genetic resources and an active interest in the steps needed both to conserve those resources and to seek to derive benefit from their conservation. After a decade of discussion, the principle of farmers' rights is now widely accepted as a useful counterpoint to the concept of breeders' rights. The challenge now is to develop new instruments, intellectual property régimes, funding mechanisms, and technologies that will provide effective incentives for:

- encouraging the conservation of biodiversity;

- encouraging local and national innovation related to biological resources; and

- justly compensating the custodians of the world's genetic resources.

32. Such resources should be viewed as being of common interest to humankind, but at the same time it needs to be recognized that nations have a right to consider them as sovereign resources. Steps to be taken might include:

- the development of mechanisms to enable governments to exercise flexibility over the choice of schemes for intellectual property protection at the same time as meeting their needs for economic development, technology transfer, and public health and nutrition. The issue of whether or not to include biological materials in trade-related discussions of intellectual property rights needs to be resolved: the impact of intellectual property protection on innovation related to biological resources has many unique features;

- farmers' rights need to be maintained and support provided to enable them to maintain the diversity of their crops and their cropping systems. Greater effort should also be made to enabling them to do their own research and to enable national research capacities to be developed to stimulate greater production and international trade;

- breeders need to pay a fair price for their "rights", which are often built on wild resources or on genetic diversity maintained by farmers. Methods need to be developed to avoid monopoly and ensure that the food production capacity of the world's farmers is expanded, not restricted. Access to genetic resources also needs to be enhanced;

- the rights of indigenous peoples need to be recognized. Indigenous people over the centuries have developed considerable wisdom, particularly on medicinal plants, agriculture, forestry, and wildlife management, but this is not currently regarded as intellectual property.

(x) Economic benefits and financial mechanisms

33. As methods for the accounting and economic analysis of the costs and benefits of biodiversity are not fully developed, it is difficult to calculate investment opportunities and priorities. Biodiversity values are poorly reflected in commodity prices, and the many non-financial values associated with ethical, moral, and cultural considerations and overall maintenance of the biosphere, though highly appreciated by societies, remain largely outside the analyses. Furthermore, while some nations bear the costs of conservation, others enjoy the benefits: indeed biodiversity conservation costs are normally incurred by the host country. It would be more useful to consider the equation in terms of investment opportunities, so that countries can invest for the maintenance of ethical, traditional, and cultural values and the promotion of new options for the local and national economy. Steps to be taken might include:

- the initiation of a major research programme to quantify the contribution of biodiversity to local and national economies. This programme should seek to undertake a comprehensive economic assessment, including the direct consumption of wild natural resources, those that are marketed, and the value of services provided by natural ecosystems. It should result in a methodology that can be easily applied at the local level, so that the economic benefits of

conserving biodiversity are recognized when costs are considered. The social and cultural benefits of conserving biodiversity would also be elaborated in the study;

- the study of financial mechanisms (for example, bilateral and multilateral funding, global environmental facility, debt-for-nature swaps, private sector investment and sponsoring) and economic incentives for the conservation of biodiversity;

- the wide distribution of the results of work already undertaken on economic incentives for the conservation of biodiversity. These should be tested in certain demonstration countries to show how they work.

(xi) Strengthening institutions for conserving biodiversity

34. In general the institutional structures for resource management do not foster biodiversity conservation and development. Most notable are those cases where species, genes and ecosystems are divided among public agencies, making comprehensive and co-ordinated management and investment particularly difficult. Institutional processes associated with land tenure and access to resources often promote migratory settlement and deforestation by denying a long-term commitment by the landless to a forest strategy.

35. One major constraint is the fundamental difference between the way natural systems function and the way government organizations are structured to manage those systems. Natural systems are highly interrelated structures with many complementary functions, while government agencies responsible for managing these systems are traditionally characterized by conflicting jurisdiction and responsibilities. Steps to be taken might include:

- the strengthening of direct resource management agencies. Institutional mechanisms need to be developed to ensure a more comprehensive approach to solving resource management conflicts by including more factors external to the decision-making processes. Long-term research and monitoring efforts should become part of the management system. The conditions under which co-ordinating efforts are likely to be effective needs to be determined. Policy obstacles to the preservation of biological resources need to be overcome and administrative procedures streamlined. Governments and the private sector need to be encouraged to work towards the same objectives. Local participation by non-governmental organizations might play an important role here. Four levels of activity might be considered:

  (a) actions at the international level, particularly to co-ordinate and harmonize the programmes of the various agencies, should be strengthened and improved, building on existing mechanisms and working as equal partners. Where appropriate, the idea that agencies be designated to take a lead role in an activity, depending on competence and mandate, should not be seen as contradictory. Currently, ongoing international programmes and mechanisms which promote biodiversity conservation are poorly funded,

(b) actions to promote collaboration among countries need to be strengthened. Case examples of collaborative activities should be prepared as models and used to enhance co-operation;

(c) there is a need to assist countries in improving their own capacities and developing their own institutions; and

(d) finally, there is a need to develop mechanisms at the community level, which although a national concern, would probably also need inputs from bilateral and multilateral sources.

Notes

1/ Report of the Preparatory Committee for the United Nations Conference on Environment and Development, Official Records of the General Assembly, A/45/46, decision 1/16.

2/ Report of the First Session of the ad hoc Working Group of Legal and Technical Experts on Biological Diversity. UNEP/BIO.DIV/WG2/1/4, 28 November 1990.

3/ Principle 3 of the Stockholm Declaration and General Assembly resolutions 44/207 and 44/228.